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Customer Success Is Our Mission

Agile Integration of Complex Systems

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Report Documentation Page

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Agile Integration of Complex Systems

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Outline

- Background and Problem
- Service Oriented Architecture (SOA) in DoD
- Baseline SOA
- Baseline SOA: Foundation (SOAF)
- Changes for Agile Integration
- Graphically enabled approach
  - SOAF vs. Graphically Enabled Discovery
  - SOAF vs. Graphically Enabled Messaging
  - SOAF vs. Graphically Enabled Mediation
- Summary

Background and Problem

- SOA is fundamental to DoD's Net-Centric Vision
- SOA provides a powerful infrastructure for integrating disparate systems and technologies through services
- Current practice relies heavily on human intervention for such integration that leaves little flexibility to the edge user

Human intervention limits SOA flexibility for edge users

Background of Problem

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- This presentation describes a graphically enabled method for reducing and simplifying the human intervention
  - Allows edge user to quickly identify non-organic systems and technologies of interest
    - Netted sensors
    - Netted effectors
    - C2
  - Provides agility during mission execution

Human intervention in using SOA can be reduced

SOA in DoD

- DoD has mandated that all systems support the Network-Centric Environment and SOA is fundamental to realizing DoD's Net-Centric Vision (DoDAF 1.5, volume 2, p. xiv and DoDAF 2.0, volume 1, p. 2)
- SOA is mandated by multiple policies, reference architectures and models, and the acquisition process (see notes view)

SOA is mandated by DoD

Baseline SOA

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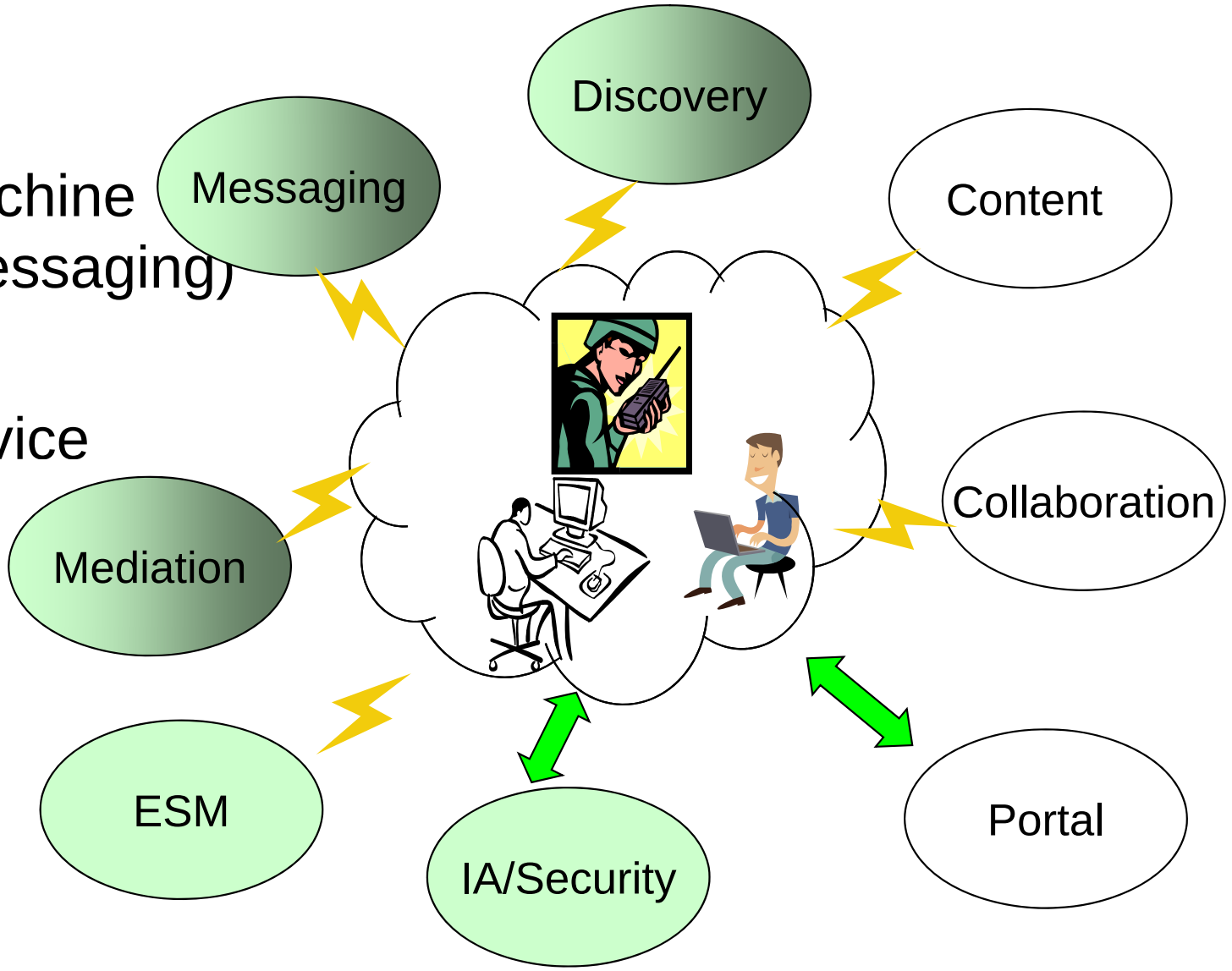
- DISA NCES CDD*
  - Provides a baseline and taxonomy that are architecture-, technology-, and vendor-neutral
  - Describes Core Enterprise Services
  - Describes SOA Foundation Services within the Core
- Agile Integration is based on graphical enablement of three of the Foundation Services

*DISA. "Capability Development Document (CDD) for Net-Centric Enterprise Services (NCES)." Increment 1.0, Version 1.0, May 2006

DISA NCES CDD provides a baseline for SOA

Baseline SOA: Foundation (SOAF)

- Discovery
- Machine to Machine Messaging (Messaging)
- Mediation
- Enterprise Service Management
- IA/Security



Foundation services provide net-centric infrastructure

Changes for Agile Integration

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- SOAF Service Discovery Service
  - Change how provider registers
  - Change how consumer finds and binds
- SOAF Messaging Service
  - Change subscription flow
  - Change alert flow
  - Change notification flow
- SOAF Mediation Service
  - Create workflow during mission execution
  - Preprovision
    - Adaptors
    - Translators

Changed three SOAF services

SOAF Service Discovery Service

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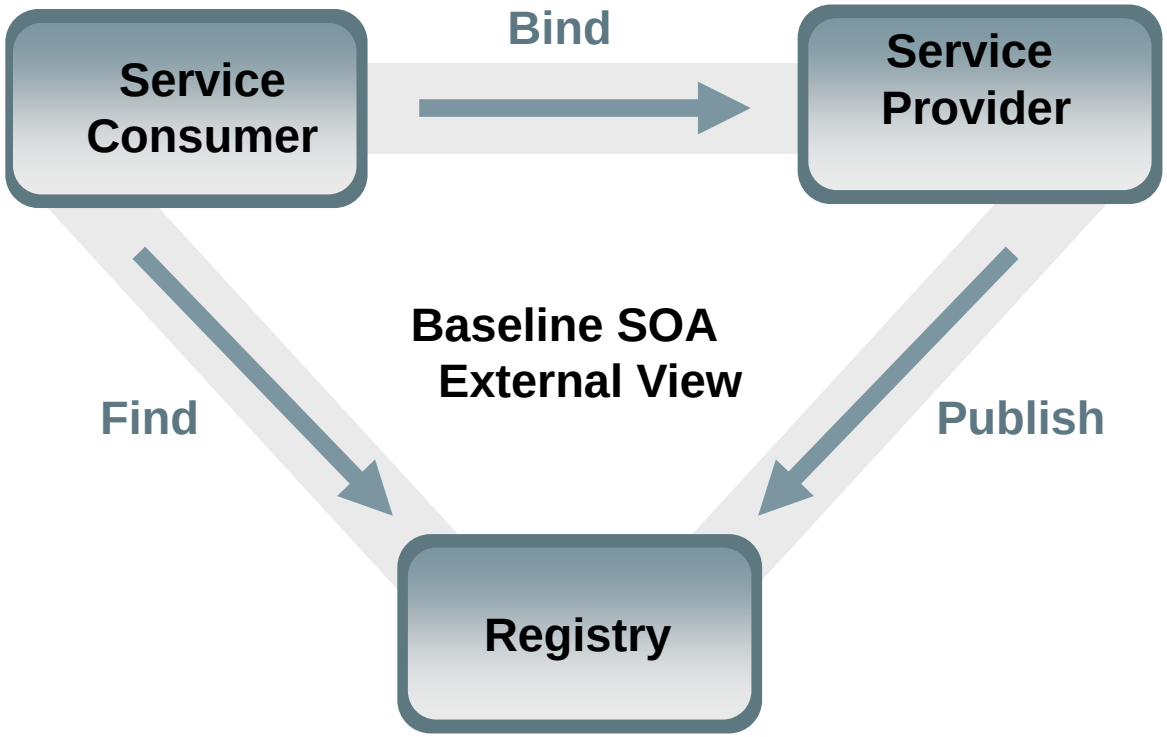
- Registries
- Consumers
- Providers
- Publish
- Find
- Bind (assign)



Discovery needed to link decoupled providers and consumers

SOAF Service Discovery – Provider

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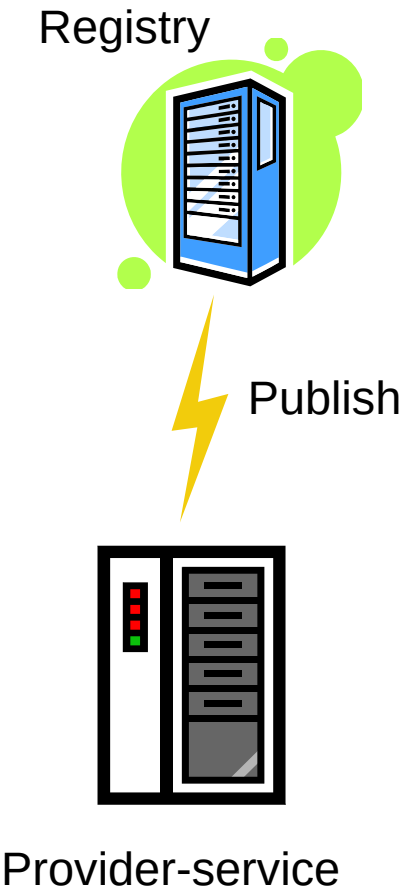
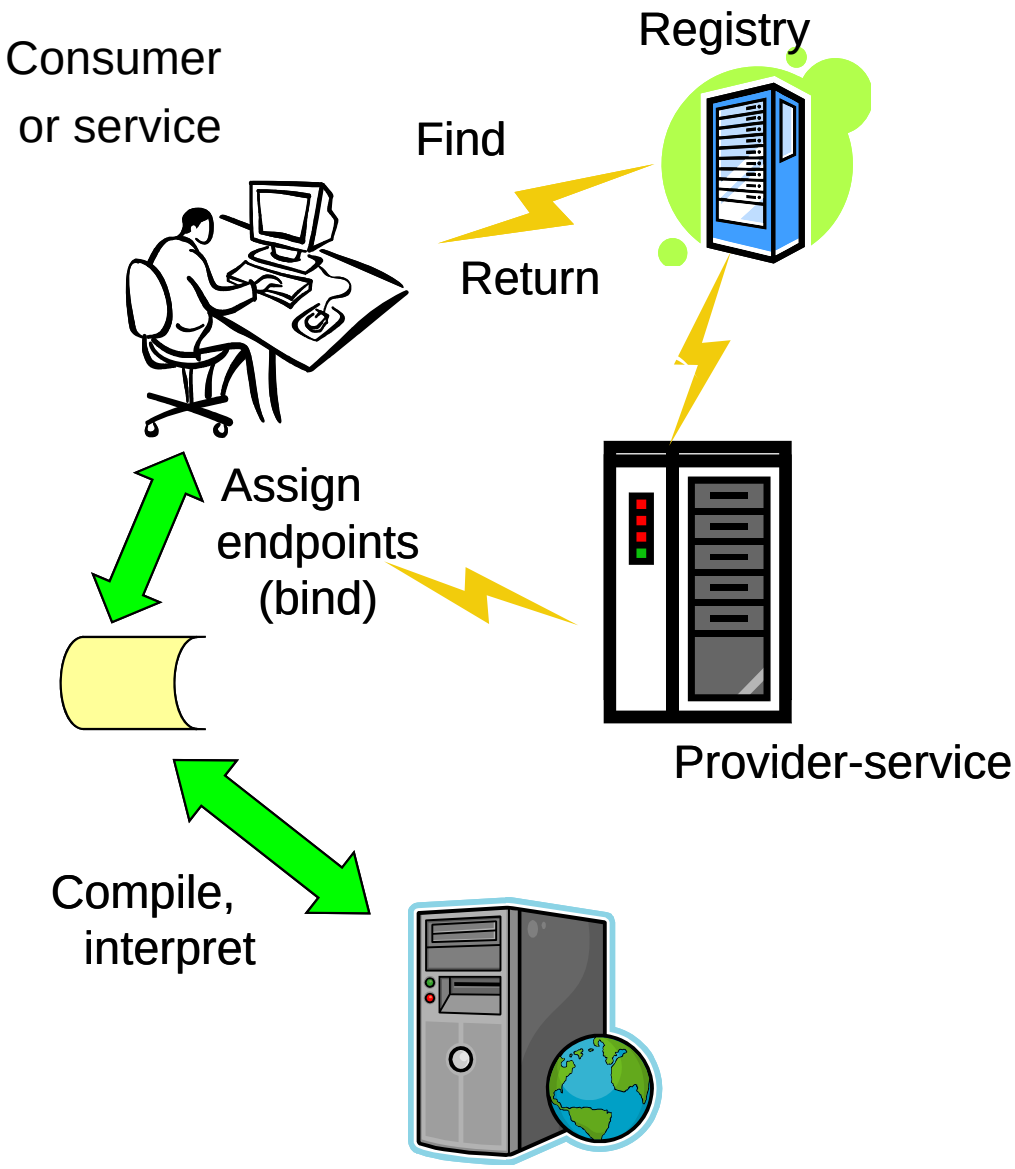
- Publish endpoints and metadata
  - Obtain certification to publish to registry
  - Use general registries
    - Service
    - Metadata
  - Publicize locations
    - Locations widely distributed
    - Available through internet searches
    - Open to large populations
    - Consumer not known in advance
    - Time of access not known in advance



Large open registries with unanticipated users

SOAF Service Discovery – Consumer

- Design time
  - Search registries manually
  - Find required services
  - Assign endpoints in code and compile (bind)
  - Human intervention
- Runtime
  - Find services dynamically (service)
  - Latency
  - Uncertainty



Human intervention or latency, uncertainty

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Graphically Enabled Discovery

- Functions reduced to enabling selection of displayed services
  - General purpose registries not used
  - Based on Community of Action (CoA) registry (slide 16)
- Whatever is placed on the edge-user's display is available for the mission
- Edge user finds a service by selecting a displayed icon
- Edge user binds the service by dragging it and dropping it on an orchestrate icon (slide 22)

Discovery simplified and made visual

SOAF Messaging Service

- Transport
- Receive, route, queue, and deliver messages
- Create new topics and/or channels
- Transmit new content
- Process subscriptions
  - New
  - Results
  - Alerts
  - Notices

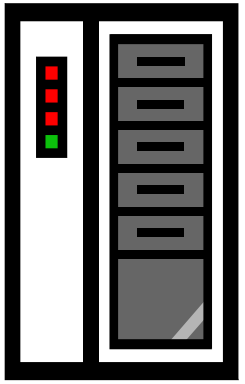
Consumer

Consumer

- Interact with transport layer
- Messages
- New topics and/or channels
- New content
- Subscriptions

Consumer

Provider



Messaging is more than a data bus

SOAF Messaging – Provider

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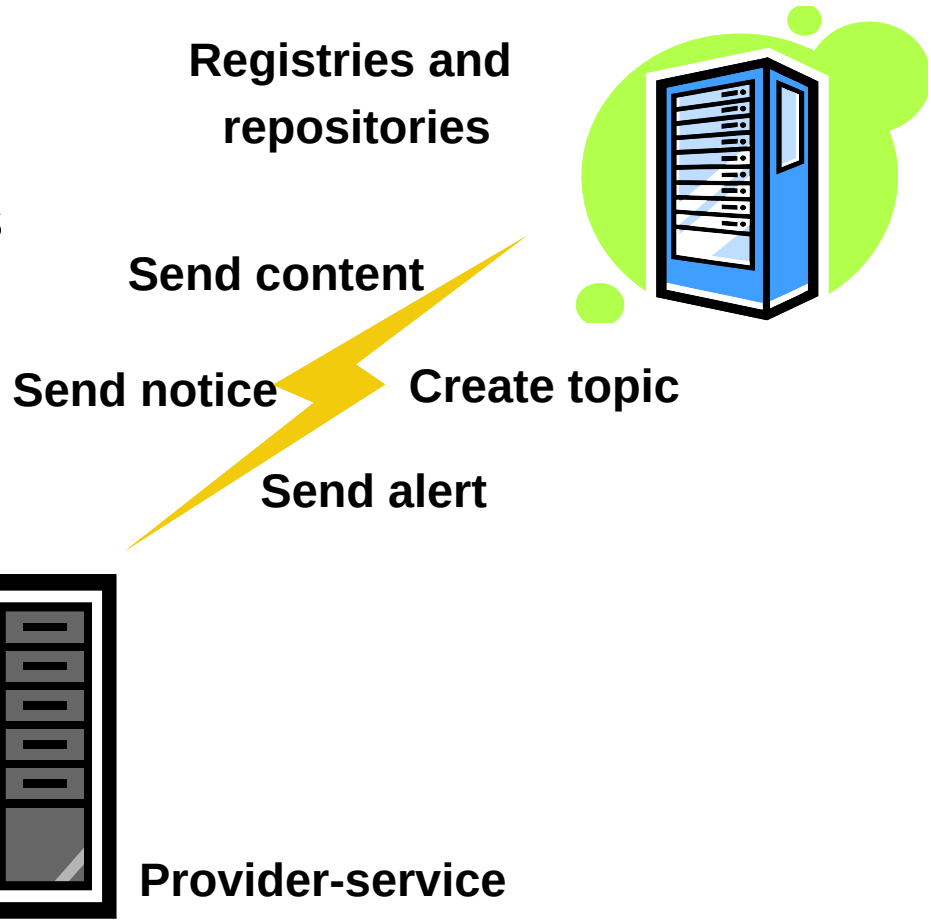
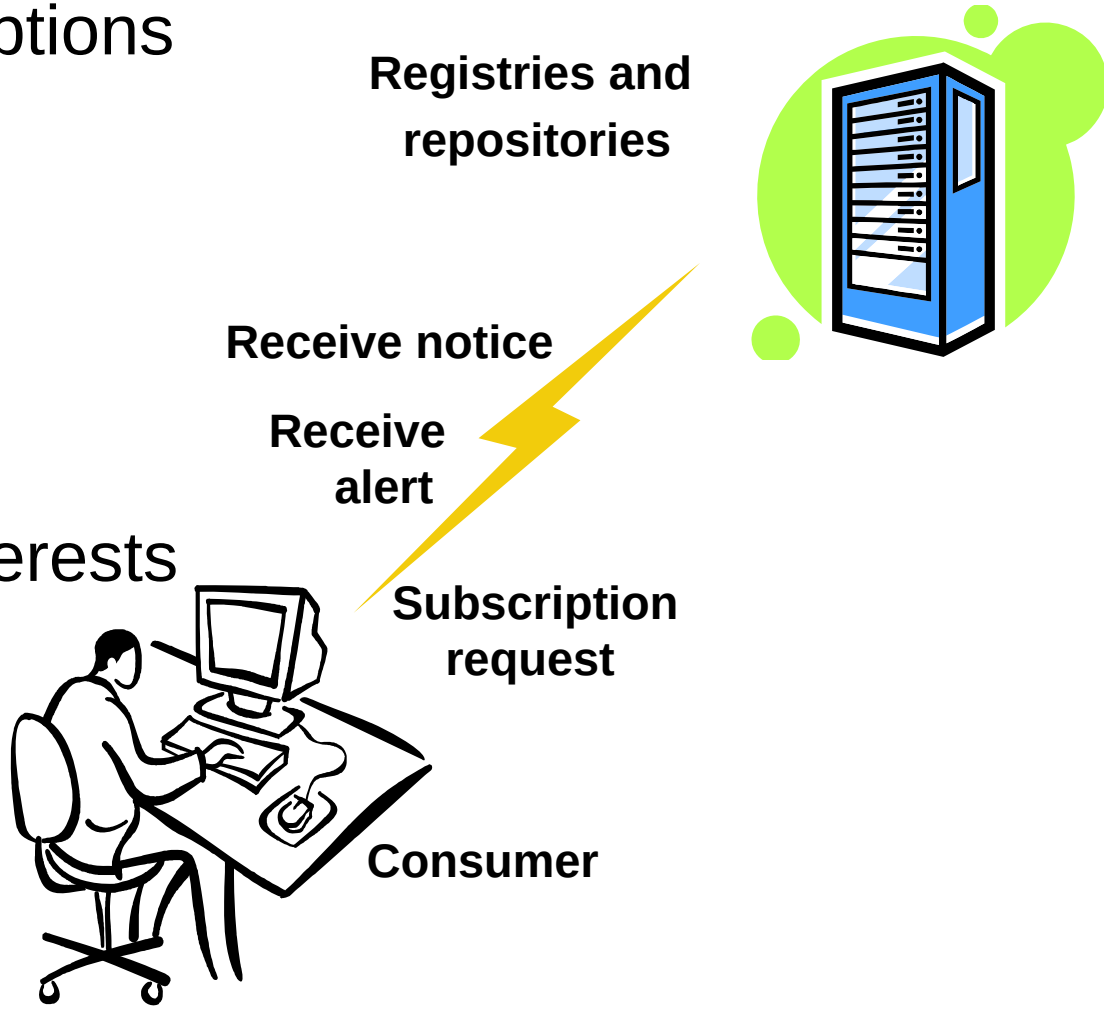
- Respond to new publications
  - Create new topic or channel
  - Send new content from publishers



Messaging is in background

SOAF Messaging – Consumer

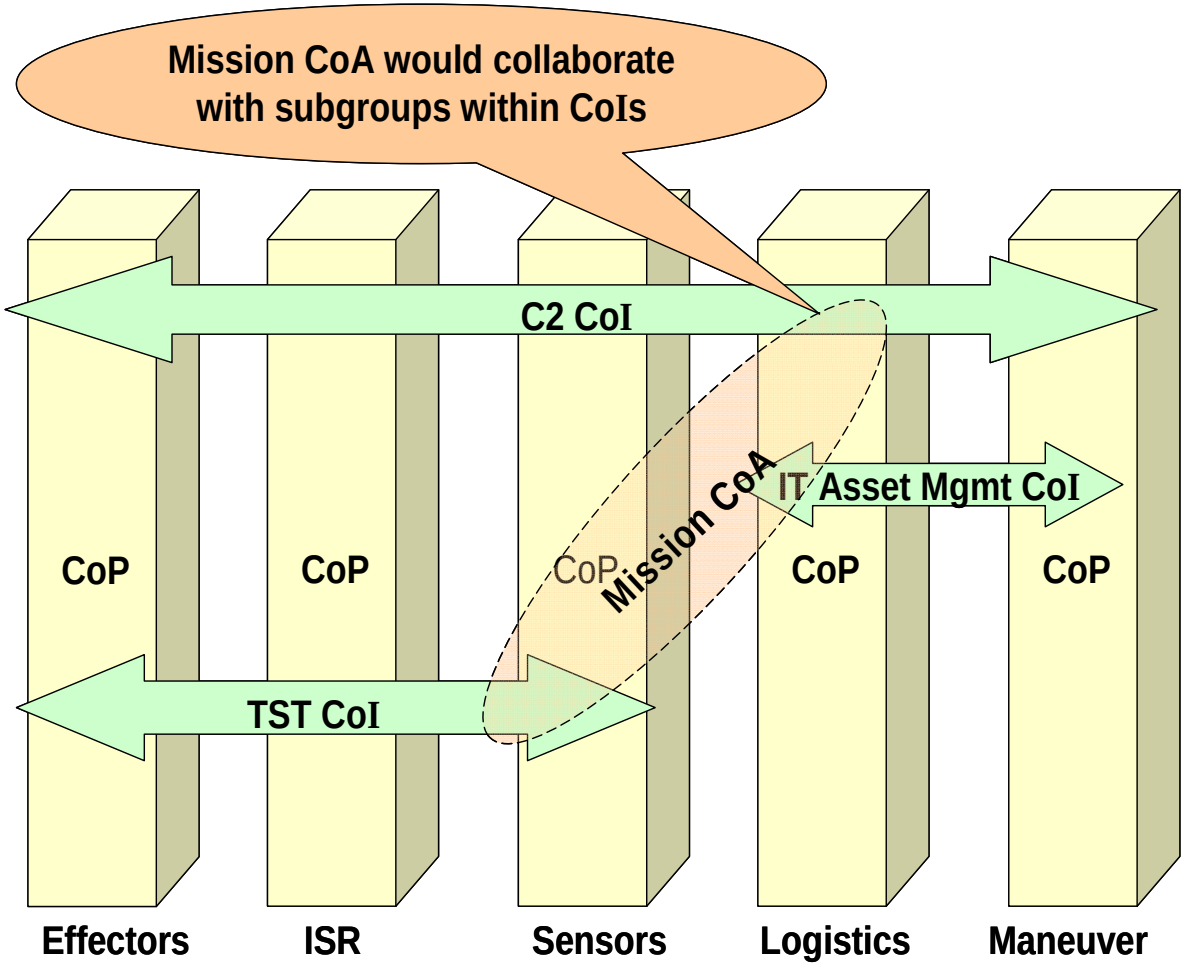
- Respond to new subscriptions
  - Topic or channel
  - Interests or preferences for content
- Send alerts for topics or channels
- Send notifications for interests or preferences (content available)



Messaging is in background

Graphically Enabled Messaging

- Registry based on CoA
  - Providers and services
  - Consumers and interests
  - Details for mediation
- Consumer entry effectively subscribes consumer to all of the services included with the consumer interests



Mission-limited registry

Graphically Enabled Messaging

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Sensor Services

C2 Services

Event service responds to new entries in CoA registry

Orchestrate

Alert provided when display service displays icon for new service on all CoA displays

Communications Services

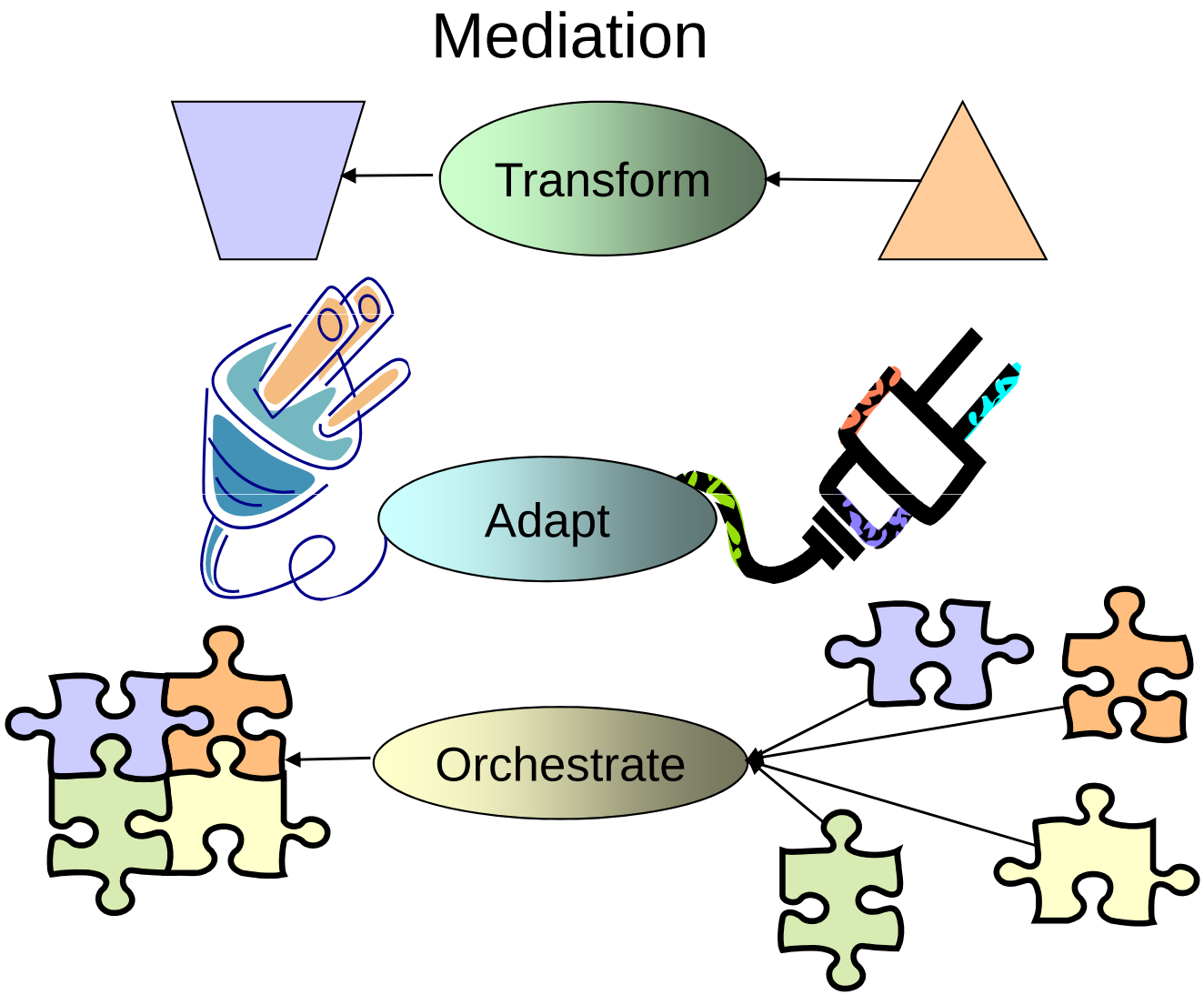
Consumers implicitly subscribe to services when they register in CoA registry

Effecter Services

Messaging is in foreground

SOAF Mediation Service

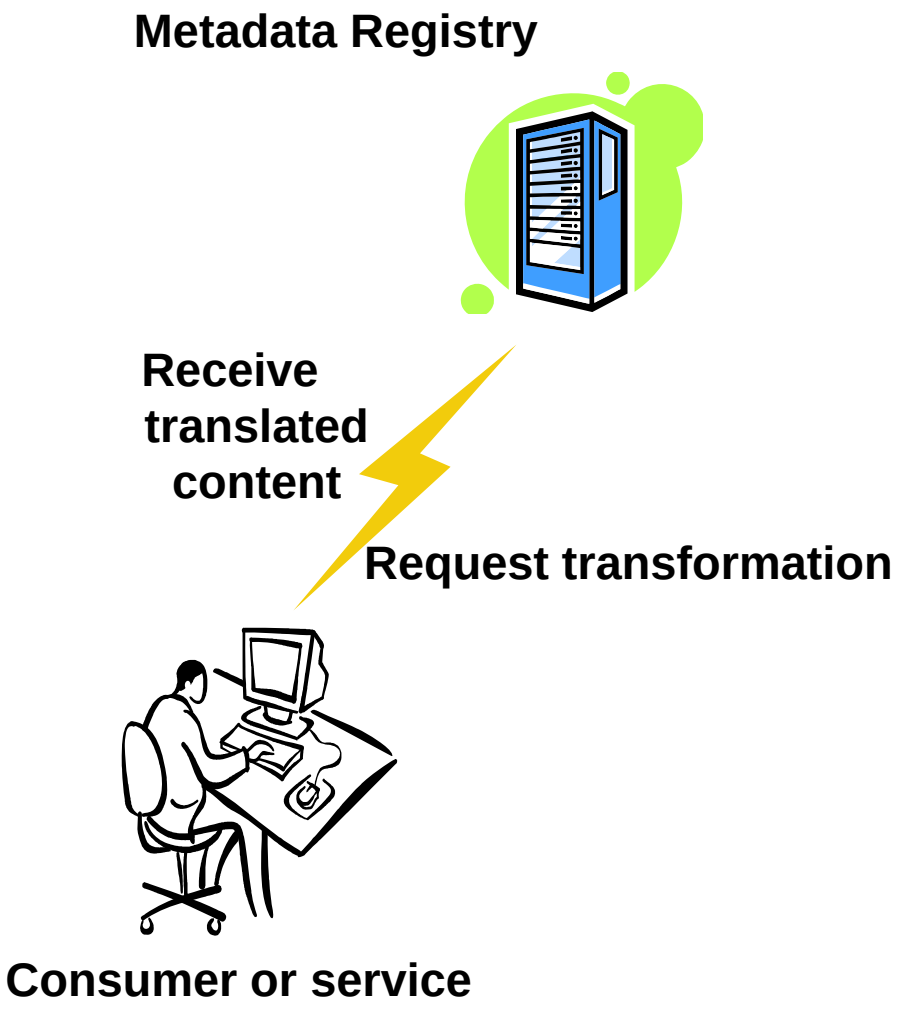
- Transformation
- Adaptation
- Orchestration



Mediation enables integration of services from disparate systems

SOAF Mediation – Transformation

- Respond to requests for format translation for content
- Find transformation, e.g., relevant schemas
- Translate content, e.g., from one XML schema to another for consumer



Transformation explicitly requested

SOAF Mediation – Adaptation

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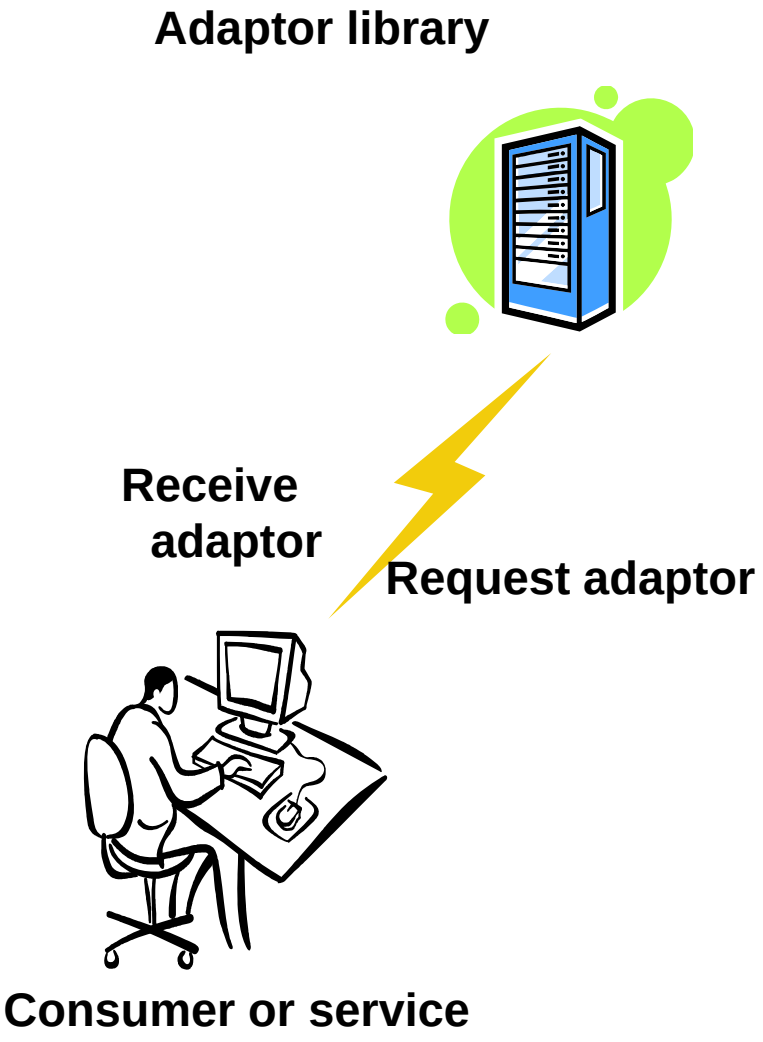
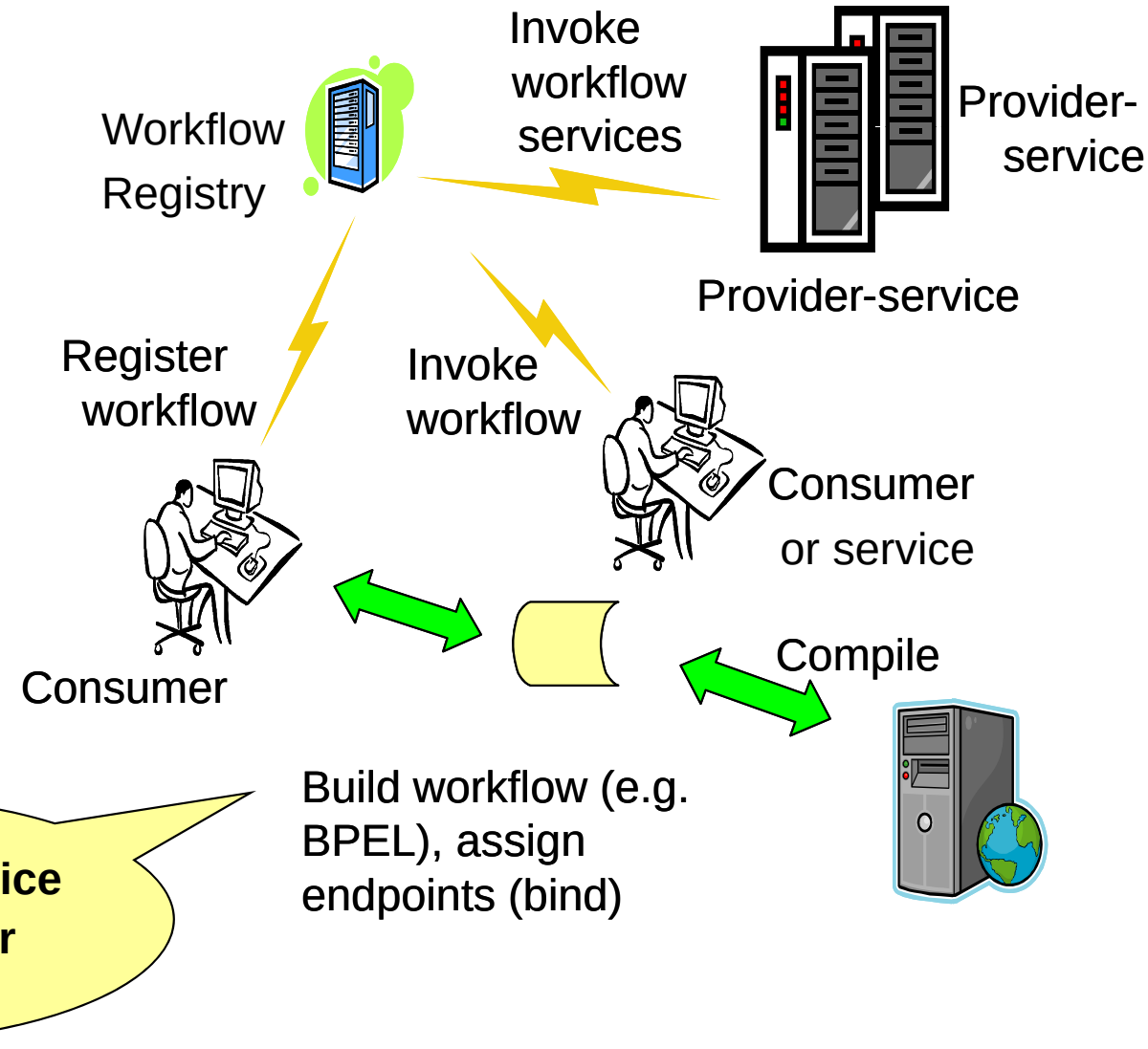
- Respond to requests for protocol adaptor
- Find adaptor
- Return adaptor to consumer



Adaptation explicitly requested

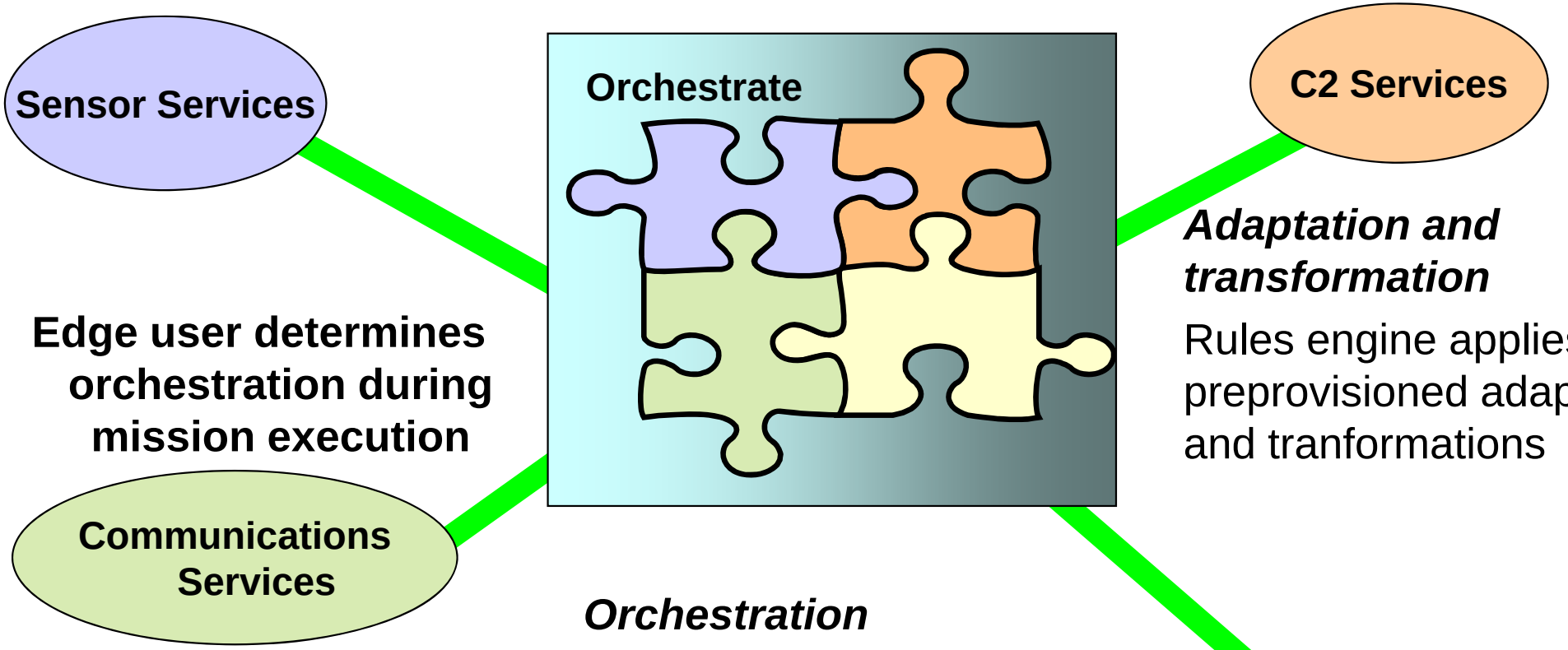
SOAF Mediation – Orchestration

- Create and register workflow script
- Retrieve workflow script (for same or different consumer)
- Execute workflow script (services from one or more providers)



Orchestrate at design and plan time

Graphically Enabled Mediation



Edge user determines orchestration during mission execution

Adaptation and transformation

Rules engine applies preprovisioned adaptors and tranformations

Orchestration

- Dragging and dropping a service icon to the orchestrate icon provides interface and other information to rules engine
- Rules engine parses information
- Rules engine connects services to complete the orchestration

Orchestrate during mission execution

Summary

- Four fundamental differences run across all three graphically enabled services
  - Graphically displayed registry
  - Mission-limited registry
  - Consumers register, but don't subscribe explicitly
  - Registry-driven
- Agile Integration provides the edge-user increased flexibility during mission execution
- Agile integration combines aspects of corresponding SOAF services as part of specializing them

Summary

- There are extensions to what was demonstrated that would be worth investigating and potentially developing
  - Creating contingency pools for resources through real-time resource management
  - Including interfaces between resource management and the CoA registry
- There are implications for doctrine and training to maximize the agility and related benefits

Acronyms

- BPEL: Business Process Execution Language
- CDD: Capability Development Document
- CoA: Community of Action
- CoI: Community of Interest
- CoP: Community of Practice
- DoDAF: DoD Architecture Framework
- ESB: Enterprise Service Bus
- ESM: Enterprise Service Management
- IA: Information Assurance
- JCIDS: Joint Capabilities Development System
- NCES: Net-Centric Enterprise Services
- SOA: Service Oriented Architecture
- SOAF: SOA Foundation
- UDDI: Universal Description, Discovery, and Integration Services
- WSDL: Web Service Definition Language
- XML: eXtensible Markup Language